about 1876, as to who invented the carbon telephone transmitter, and we are told that the Edison carbon transmitter "held the monopoly of the telephone in England for many years." In the next chapter, "the pretensions of his rival" are touched on, and Edison's remark, that "one of the biggest steals ever made was filched directly from my telephone," is quoted.

"The individual mistress of Edison's heart until now had been science, but a new potency was at hand equally strong, but immeasurably more subtle and all-pervading." Then the authors drop into poetry, which they have a way of doing on all possible occasions. Later on we are told that "prior to his marriage Edison portioned out the hours of sleeping and waking by the ebb and flow of the Divine afflatus," and that his "blood after having served the purpose of stimulating the capillary vessels of the brain, and inducing inventive capacity, soon retreats quietly to its legitimate source." We note in this chapter references to "Mrs. Noah's superior faculties," the Roman Empire, Carthage and her glory, a Phœnician axiom, and a disquisition on "the sickly and mercurial sentimentality of the Oriental and Latinic races," "the Plutonian broths of Sparta," "the delicious pastoral flavour to the *Allegretto* and the *Lycidas*." We presume Milton's title "l'Allegro" was not long enough for the authors; and all this while Edison has been left gazing at a test-tube in a large photograph on page 95 of this book.

By 1876 forty-five of his distinct inventions were in different processes of completion; £100,000 had been realised from the manufacture and the sale of patents; and the throng of sight-seers to Edison's laboratory at Newark became so great that he moved to Menlo Park, twenty-four miles from New York, and stacked there his "cases of every ordinary and extraordinary device born of that prolific parent, necessity."

The first sketch of the phonograph, on p. 123, is of real interest, for we regard the phonograph as scientifically the greatest of Edison's achievements, in that Edison accomplished with its use, in an extremely simple way, what the previous elaborate talking-machines could not perform. But why the microscopic examination of the tin-foil showed that "the feminine members of the alphabet were less aggressive in their outlines than their masculine coadjutors," or why the "long E vindicated her rights to female enfranchisement," we know not.

Descriptions of various forms of phonographs, phonographic dolls, &c., take us to the end of chapter xi. Chapter xii. is devoted to telegraphing from trains in motion, a subject that is certainly worthy of more consideration than it has yet received, and to Edison's pyromagnetic motor, which, from its principle of construction, could never have been commercially successful.

The chapters on the development of the glow-lamp by Edison, and those associated with him, are some of the most interesting in this book. Phlegmatic indeed must be the reader who does not feel inspired by the enthusiasm which led Edison to despatch Mr. Moore to search through China and Japan, Mr. McGowan to explore the American continent from the Atlantic to the Pacific, and Mr. Ricalton to seek in India, Ceylon, and the neighbouring countries for a vegetable fibre suitable for being carbonised into a glow-lamp filament. But, if the reader be of a critical temperament, his pleasure at reading the account of these explorations will be diminished by the many faults which mar the description.

For example, the large picture on p. 217 of "Cingalese Women, photographed by Mr. Ricalton in his Search for Fibre," was never taken in Ceylon, since it is obviously a photograph of a group of *Japanese* girls posed in front of a theatrical back scene. One of these girls is sitting on a Western rustic garden-chair; so, perhaps, the photograph was taken in New York or Paris, on the principle followed by the special correspondent in the Soudan war, whose envelopes bore the St. John's Wood post-mark. Oddly enough, the book contains several other photographs of Cingalese people taken by Mr. Ricalton; but the authors do not seem to have been struck with the fact that a comparatively small island like Ceylon should have possessed inhabitants of such a variety of different types.

A great deal of tall talk follows about Edison's work on the dynamo machine. "Ah! potent wizard, you shame the records of the Arabian nights and the fabled glories of the East," &c., with the following surprising bit of information for the Englishman: "To-day there is not a hamlet in England, however insignificant, which is not in vital connection with the central sources of supply," that is, has electric energy supplied to it from a central electric light station. Passing over pages of grandiloquence, we come to a long description of Edison's factory and laboratories at Orange. The pictures remind us of what we ourselves saw when visiting Edison, but we have no recollection that in the laboratory "fragrant gums and spices recall memories of the fair Babe of Bethlehem." In fact, what we chiefly remember was our surprise at the large number of phonographs which we saw in course of manufacture, and Edison's sallies of laughter at the simplicity of the English in being so easily gulled by limited liability companies.

Although this book is in parts as silly as anything we have ever read, it is nevertheless full of interest; for it gives a graphic picture of the struggles and success of one who is certainly remarkable for his quickness of insight, originality, and capacity for long stretches of hard work, even if we do not agree with the authors that he is "the greatest genius of this or any other age." Even if we were not told on the title-page that the book was written by W. K. L. and Antonia Dickson, we should feel quite sure that it was a joint production, one of the authors being Edison's superintendent of the experimental department in New York, and the other a poetic rhapsodist who has never read her "Mark Twain." The illustrations are well executed, the printing and paper good, and the general get-up of the book all that can be desired of an expensive quarto volume to lie on the drawing-room table. But why was it not edited? asks the English reader.

"P. D."

CRIMINAL IDENTIFICATION.

Finger-print Directories. By Francis Galton, F.R.S, (London: Macmillan and Co., 1895.)

It will be remembered that the Departmental Committee which reported in the beginning of last year upon the best method of identifying habitual criminals, re-

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commended the adoption of the Bertillon system of measurement conjointly with the plan of taking finger-prints now associated in this country with the name of Mr. Francis Galton. He loyally disclaims the honour of being the first to use it; that rests with Sir William Herschel, of the Indian Civil Service. But it is really from the unwearied labours of Mr. Galton that the scientific certainty of the system has been fully proved. He has so simplified the processes of taking and recording the impressions of the finger, has invented so complete and intelligible a series of indications and formulas, that the system can now be worked with the greatest facility and with mathematical precision. Of the supreme value of the finger-print as a means of identification, there can be no manner of doubt. It is, as Mr. Galton happily describes it, "an automatic sign-manual subject to no fault of observation or clerical error, and trustworthy throughout life." The Committee above quoted fully recognised this. "Finger-prints," they reported, "are an absolute impression taken direct from the body itself; if a print be taken at all, it must be necessarily correct." But they were met with the difficulty of classification as applied to any large collection of impressions. Where these were comparatively few, the index adopted by Mr. Galton was admirable and most effective. But where the numbers rose to many thousands, as would of course be the case in a criminal register, it might be a serious question whether searches could be made with reasonable facility and dispatch. It was for this reason that the double system of identification was recommended, for the strongest point in the Bertillon plan of measurement as practised in Paris was its perfect classification. There the particular card required, giving the name and antecedents of an individual, "could be found as certainly and almost as quickly as an accurately spelt word could be found in the dictionary."

Since then Mr. Francis Galton has devoted much time and very highly skilled intelligence to enlarging his methods of indexing and proving beyond all question the usefulness of the finger-prints. He now tells us, in his new work on "Finger-print Directories," how these indexes may be most easily and surely constructed, how the work of reference and search can be easily and quickly performed. Of course the result is largely dependent upon the size of the directory, the number of "sets" of impressions that have been collected to compose it. Mr. Galton's experiments were made with two collections, one of 300 complete sets of finger-prints, the other with 2632. In both, even with the largest, he was entirely successful. "The efficiency of a directory," as he says, "depends on its power of breaking up, with the maximum of surety and the minimum of labour, a collection of sets into groups of which even the largest shall be easily manageable, so that when a group is designated as that in which the set searched for must be, if it exists anywhere in the collection, it shall be quickly discovered." The collection that Mr. Galton finds most easily manageable is not necessarily the smallest, but that which lends itself best to search, in its character and its form. The one he has adopted is the card catalogue: "a collection of separate cards stacked behind one another in the separate order of their formula." Mr. Galton timed himself in his examination of 156 sets in his largest collection, which fell all under the same formula. Eight searches were made, during which a total of 373 cards were examined, and the time taken was a little over thirty-six minutes. Mr. Galton could therefore get through ten cards per minute, the trouble of opening the drawer or other receptacle having been done by an assistant. It is interesting to note that Mr. Galton in his inquiries first accepted the "whorl" as the basis of classification, thinking that from its almost endless variety of shape it would be the most useful of the three forms of impression; but as he went on he discarded it in favour of the "loop," the plainer forms of which could be "classed numerically by the simple expedient of recording the number of ridges in each of them that are crossed by an imaginary line drawn between two definite termini."

For a minute and detailed account of the primary and secondary classification of finger-prints, as well as for the best methods of taking them and studying their forms, we must refer the reader to Mr. Galton's new book. This most useful work contains a number of woodcuts and ample indications for the instruction and guidance of the student, with a specimen-book directory for three hundred sets. But whether the index is in the form of a book or of cards, Mr. Galton affirms, on perfectly good grounds, that it is quite possible to have "a finger-print directory, even of three thousand sets or more, that shall discriminate to within two or three sets." There can be no question, therefore, but that the whole system has passed out of the academic stage into one of real practical usefulness; and we may expect to see it applied for other purposes than that of criminal identification. Now that it has been made really manageable, it may be strongly recommended, for instance, to the military authorities as an infallible method of checking desertion and fraudulent re-enlistment. It appears that out of 35,000 men who enlist annually, 5000 desert, and only half are recaptured. Of the other half many, undoubtedly, re-enlist. Although the exact number cannot be positively fixed, it is estimated at 600, all of whom defraud the exchequer to the value of their second bounty and outfit. If, however, the finger-prints of all recruits were taken on attestation, and a register formed on the plan of the directories constructed by Mr. Galton, indisputable evidence would be afforded which would certainly convict the re-enlisted deserter of his original offence

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BIRDS, BEASTS AND FISHES OF THE NORFOLK BROADLAND.

Birds, Beasts and Fishes of the Norfolk Broadland. By P. H. Emerson. 8vo, pp. 396, illustrated. (London: David Nutt, 1895.)

AFTER reading the severe criticisms passed on the works of several eminent British ornithologists—especially as regards illustrations—in the introductory chapter to the volume before us, we hoped we were going to be rewarded by finding something that would eclipse all previous efforts, both in the way of letter-press and plates. But we do not hesitate to say that in both respects we are disappointed. After all the writing about the "caricatures" of Bewick, and the "monstrous and gaudy decorations" of Selby, Gould, and Dresser, we find

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